

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.116 – EXPEDITED PROCEDURE

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REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on November 27, 2002, and the references cited therewith. Claims 186-189 have been added. Claims 1-77 and 186-189 are now pending in this application. Applicant does not admit that the cited references are prior art and reserves the right to swear behind these cited references as provided for under 37 C.F.R. 1.1131.

Information Disclosure Statement

Applicant respectfully requests that a copy of the 1449 Form, listing all references that were submitted with the Information Disclosure Statement filed on August 21, 2002, marked as being considered and initialed by the Examiner, be returned with the next official communication.

§103 Rejection of the Claims

Claims 1-5, 7-12, 14-15, 17-20, 22-23, 25, 27, 29-30, 32-34, 36-38, 40-42, 44-45, 47-50, 52-56, 58-59, 60, 62-65, and 72 were rejected under 35 USC § 103(a) as being unpatentable over Dubin et al in view of Ting et al. and Brown et al. (U.S. 6,168,704). Claims 6 and 66 were rejected under 35 USC § 103(a) as being unpatentable over Dubin et al. in view of Ting et al. and Brown et al. as applied to claims 1-5, 7-12, 14-15, 17-20, 22-23, 25, 27, 29-30, 32-34, 36-38, 40-42, 44-45, 47-50, 52-56, 58-59, 60, 62-65, and 72 and further in view of Farkas et al. (6,001,730), as previously applied. Claims 13, 16, 21, 24, 28, 31, 35, 39, 43, 46, 51, 57, 61 and 67-77 were rejected under 35 USC § 103(a) as being unpatentable over Dubin et al in view of Ting et al. and Brown et al., and further in view of Nogami et al, as previously applied. Applicant respectfully traverses these rejections.

Claims 1-3

With regard to claim 1, among the differences, claim 1 recites "depositing a seed layer on the barrier layer." The Office Action indicated that this limitations is disclosed by Dublin by Figure 3 and at column 4, lines 29-39. See Office Action at ¶2. Further, in the "Response to Arguments" section, the Office Action indicated that "Dubin et al. performs an anneal process to

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form an aluminum/copper/titanium nitride multilayer film, thus the copper-aluminum film becomes a part of the barrier layer, and the seed layer is therefore deposited on the barrier layer.” Office Action (Response to Arguments) at ¶3. In other words, the Office Action is implying that when a conductive layer, which is on top of a barrier layer, is annealed, the conductive layer is transformed to become a part of the barrier layer (i.e., the conductive layer is absorbed into the barrier layer). Applicant respectfully traverses this assertion. As defined, the word “anneal” is defined to mean to “to subject (glass or metal) to heat and slow cooling so as to toughen and reduce bitterness”. Webster’s II New College Dictionary (Houghton Mifflin Co., Boston) (1995) (p. 45). The word “anneal” is not defined to include a transformation of a material and/or absorption of one material into a different material. Therefore, Dubin discloses the deposition of a copper-aluminum film on a barrier layer and not the deposition of a seed layer on the barrier layer.

Furthermore, claim 1 recites “depositing an insulator over a planarized surface” (emphasis added). In the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 1. Therefore, Applicant respectfully submits that the rejection of claim 1 has been overcome and that this claim is in condition for

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allowance. Because claims 2-3 depend from and further define claim 1, Applicant respectfully submits that the rejections of claims 2-3 have been overcome and that these claims are in condition for allowance.

Claims 4-7

With regard to claim 4, among the differences, claim 4 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. In the absence of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 4.

Furthermore, with regard to claim 4, among the differences, claim 4 recites “depositing a seed layer on the barrier layer.” The Office Action indicated that this limitation is disclosed by Dublin by Figure 3 and at column 4, lines 29-39. See Office Action at ¶2. Further, in the

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“Response to Arguments” section, the Office Action indicated that “Dubin et al. performs an anneal process to form an aluminum/copper/titanium nitride multilayer film, thus the copper-aluminum film becomes a part of the barrier layer, and the seed layer is therefore deposited on the barrier layer.” Office Action (Response to Arguments) at ¶3. In other words, the Office Action is implying that when a conductive layer, which is on top of a barrier layer, is annealed, the conductive layer is transformed to become a part of the barrier layer (i.e., the conductive layer is absorbed into the barrier layer). Applicant respectfully traverses this assertion. As defined, the word “anneal” is defined to mean to “to subject (glass or metal) to heat and slow cooling so as to toughen and reduce bitterness”. Webster’s II New College Dictionary (Houghton Mifflin Co., Boston) (1995) (p. 45). The word “anneal” is not defined to include a transformation of a material and/or absorption of one material into a different material. Therefore, Dubin discloses the deposition of a copper-aluminum film on a barrier layer and not the deposition of a seed layer on the barrier layer. Therefore, Applicant respectfully submits that the rejection of claim 4 has been overcome and that this claim is in condition for allowance. Because claims 5 and 7 depend from and further define claim 4, Applicant respectfully submits that the rejections of claims 5 and 7 have been overcome and that these claims are in condition for allowance.

With regard to claim 6 in addition to the remarks set forth above regarding claim 4 from which claim 6 depends, Applicant respectfully submits the following remarks. Among the differences, claim 6 recites “wherein depositing an oxide layer over a planarized surface comprises: depositing a fluorinated silicon oxide layer over the planarized surface.” The Office Action indicated that this limitation is “conventional.” Office Action at ¶3. The Office Action further indicated that “[f]luorinated silicon oxide and silicon dioxide are known in the art as equivalent alternatives for interlayer dielectric (ILD)”, citing Farkas at column 4, lines 12-23 as disclosing fluorinated silicon oxide. Office Action at ¶3. Furthermore, the Office Action indicated that

“[i]t would have been obvious to one ordinarily skilled in the art at the time the invention was made to select any one of these material as a suitable Dubin’s insulator layer 12 or Brown’s insulator layer, since it has been held to be within the general skill of a worker in

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the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416. Office Action at ¶3.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. In the absence of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 6. Therefore, Applicant respectfully submits that the rejection of claim 6 has been overcome and that this claim is in condition for allowance.

Claims 8-11

With regard to claim 8, among the differences, claim 8 recites “depositing a polymer layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Ting at column 8, lines 36-44. Applicant respectfully traverses this assertion. This citation in Ting discloses that a dielectric layer 11 can be formed from “polymers such as polyimides . . .” Ting at column 8, lines 36-44. However, Ting does not disclose or suggest that this dielectric layer 11 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore,

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Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 8.

Furthermore, with regard to claim 8, among the differences, claim 8, as amended, recites "depositing a seed layer on the polymer layer." The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on a polymer layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 8 has been overcome and that this claim is in condition for allowance. Because claims 9-11 depend from and further define claim 8, Applicant respectfully submits that the rejections of claims 9-11 have been overcome and that these claims are in condition for allowance.

Claims 12-14

With regard to claim 12, among the differences, claim 12 recites "depositing an oxide layer over a planarized surface." (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 "is typically formed out of silicon dioxide." However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the "Response to Arguments" section, the Office Action indicated that

the limitation of "depositing an insulator over a planarized surface" is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

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Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. In the absence of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 12.

Furthermore, with regard to claim 12, among the differences, claim 12 recites “depositing a seed layer selected from the group consisting of gold, silver, and copper on the oxide layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on an oxide layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absence of a citation, Applicant respectfully submits that the rejection of claim 12 has been overcome and that this claim is in condition for allowance. Because claims 13-14 depend from and further define claim 12, Applicant respectfully submits that the rejections of claims 13-14 have been overcome and that these claims are in condition for allowance.

Claims 15-18

With regard to claim 15, among the differences, claim 15 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface”
is a well known process step that is demonstrated by the Brown et

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al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 15.

Furthermore, with regard to claim 15, among the differences, claim 15 recites “depositing a seed layer of gold on the oxide layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on an oxide layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 15 has been overcome and that this claim is in condition for allowance. Because claims 16-18 depend from and further define claim 15, Applicant respectfully submits that the rejections of claims 16-18 have been overcome and that these claims are in condition for allowance.

Claims 19-22

With regard to claim 19, among the differences, claim 19 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

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Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. In the absence of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 19.

Furthermore, with regard to claim 19, among the differences, claim 19 recites “depositing a seed layer of silver on the oxide layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. Accordingly, Applicant respectfully requests such a citation. In the absence of a citation, Applicant respectfully submits that the rejection of claim 19 has been overcome and that this claim is in condition for allowance. Because claims 20-22 depend from and further define claim 19, Applicant respectfully submits that the rejections of claims 20-22 have been overcome and that these claims are in condition for allowance.

Claims 23-26

With regard to claim 23, among the differences, claim 23 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of

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silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 23.

Furthermore, with regard to claim 23, among the differences, claim 23 recites “depositing a seed layer of copper on the oxide layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on an oxide layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 23 has been overcome and that this claim is in condition for allowance. Because claims 24-26 depend from and further define claim 23, Applicant respectfully submits that the rejections of claims 24-26 have been overcome and that these claims are in condition for allowance.

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Claims 27-29

With regard to claim 27, among the differences, claim 27 recites “depositing a polymer layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Ting at column 8, lines 36-44. Applicant respectfully traverses this assertion. This citation in Ting discloses that a dielectric layer 11 can be formed from “polymers such as polyimides . . .” Ting at column 8, lines 36-44. However, Ting does not disclose or suggest that this dielectric layer 11 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 27.

Furthermore, with regard to claim 27, among the differences, claim 27 recites “depositing a seed layer selected from the group consisting of gold, silver, and copper on the polymer layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on a polymer layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absence of a citation, Applicant respectfully submits that the rejection of claim 27 has been overcome and

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that this claim is in condition for allowance. Because claims 28-29 depend from and further define claim 27, Applicant respectfully submits that the rejections of claims 28-29 have been overcome and that these claims are in condition for allowance.

Claims 30-33

With regard to claim 30, among the differences, claim 30 recites “depositing a polymer layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Ting at column 8, lines 36-44. Applicant respectfully traverses this assertion. This citation in Ting discloses that a dielectric layer 11 can be formed from “polymers such as polyimides . . .” Ting at column 8, lines 36-44. However, Ting does not disclose or suggest that this dielectric layer 11 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation; a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 30.

Furthermore, with regard to claim 30, among the differences, claim 30 recites “depositing a seed layer of gold on the polymer layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation

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of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on a polymer layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 30 has been overcome and that this claim is in condition for allowance. Because claims 31-33 depend from and further define claim 30, Applicant respectfully submits that the rejections of claims 31-33 have been overcome and that these claims are in condition for allowance.

Claims 34-37

With regard to claim 34, among the differences, claim 34 recites “depositing a polymer layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Ting at column 8, lines 36-44. Applicant respectfully traverses this assertion. This citation in Ting discloses that a dielectric layer 11 can be formed from “polymers such as polyimides . . .” Ting at column 8, lines 36-44. However, Ting does not disclose or suggest that this dielectric layer 11 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the

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absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 34.

Furthermore, with regard to claim 34, among the differences, claim 34 recites “depositing a seed layer of silver on the polymer layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on a polymer layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 34 has been overcome and that this claim is in condition for allowance. Because claims 35-37 depend from and further define claim 34, Applicant respectfully submits that the rejections of claims 35-37 have been overcome and that these claims are in condition for allowance.

Claims 38-41

With regard to claim 38, among the differences, claim 38 recites “depositing a polymer layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Ting at column 8, lines 36-44. Applicant respectfully traverses this assertion. This citation in Ting discloses that a dielectric layer 11 can formed from “polymers such as polyimides . . .” Ting at column 8, lines 36-44. However, Ting does not disclose or suggest that this dielectric layer 11 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶12.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action

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indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 38.

Furthermore, with regard to claim 38, among the differences, claim 38 recites “depositing a seed layer of copper on the polymer layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on a polymer layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claim 38 has been overcome and that this claim is in condition for allowance. Because claims 39-41 depend from and further define claim 38, Applicant respectfully submits that the rejections of claims 39-41 have been overcome and that these claims are in condition for allowance.

Claims 42-55

With regard to claims 42, 45 and 50, among the differences, such claims recite “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon

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which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claims 42, 45 and 50.

Furthermore, with regard to claims 42, 45 and 50, among the differences, claims 42, 45 and 50 recite “depositing a seed layer of aluminum-copper on the oxide layer.” The Office Action does not indicate where such a limitation is disclosed by the cited art. In particular, the Office Action indicates that a limitation of a seed layer over a barrier layer is disclosed with regard to claim 1, but does not indicate a limitation of a seed layer on an oxide layer is disclosed. Accordingly, Applicant respectfully requests such a citation. In the absent of a citation, Applicant respectfully submits that the rejection of claims 42, 45 and 50 has been overcome and that these claims are in condition for allowance. Because claims 43-44, 46-49 and 51-55 respectively depend from and further define claims 42, 45 and 50, Applicant respectfully submits that the rejections of claims 43-44, 46-49 and 51-55 have been overcome and that these claims are in condition for allowance.

Claims 56-66

With regard to claim 56, among the differences, claim 56 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

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the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 56.

Furthermore, with regard to claim 56, among the differences, claim 56 recites “depositing a seed layer on the tantalum layer.” The Office Action indicated that this limitation is disclosed by Dublin at column 4, lines 7-15. See Office Action at ¶2. Further, in the “Response to Arguments” section, the Office Action indicated that “Dubin et al. performs an anneal process to form an aluminum/copper/titanium nitride multilayer film, thus the copper-aluminum film becomes a part of the barrier layer, and the seed layer is therefore deposited on the barrier layer.” Office Action (Response to Arguments) at ¶3. In other words, the Office Action is implying that when a conductive layer, which is on top of a barrier layer, is annealed, the conductive layer is transformed to become a part of the barrier layer (i.e., the conductive layer is absorbed into the barrier layer). Applicant respectfully traverses this assertion. As defined, the word “anneal” is defined to mean to “to subject (glass or metal) to heat and slow cooling so as to toughen and reduce bitterness”. Webster’s II New College Dictionary (Houghton Mifflin Co., Boston) (1995) (p. 45). The word “anneal” is not defined to include a transformation of a material and/or absorption of one material into a different material. Therefore, Dubin discloses the deposition of a copper-aluminum film on a barrier layer and not the deposition of a seed layer on the barrier

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layer. Therefore, Applicant respectfully submits that the rejection of claim 56 has been overcome and that this claim is in condition for allowance. Because claims 57-65 depend from and further define claim 56, Applicant respectfully submits that the rejections of claims 57-65 have been overcome and that these claims are in condition for allowance.

With regard to claim 66 in addition to the remarks set forth above regarding claim 56 from which claim 66 depends, Applicant respectfully submits the following remarks. Among the differences, claim 66 recites “wherein depositing an oxide layer over a planarized surface comprises: depositing a fluorinated silicon oxide layer over the planarized surface.” The Office Action indicated that this limitation is “conventional.” Office Action at ¶3. The Office Action further indicated that “[f]luorinated silicon oxide and silicon dioxide are known in the art as equivalent alternatives for interlayer dielectric (ILD)”, citing Farkas at column 4, lines 12-23 as disclosing fluorinated silicon oxide. Office Action at ¶3. Furthermore, the Office Action indicated that

“[i]t would have been obvious to one ordinarily skilled in the art at the time the invention was made to select any one of these material as a suitable Dubin’s insulator layer 12 or Brown’s insulator layer, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416. Office Action at ¶3.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. In the absence of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 66. Therefore, Applicant respectfully submits that the rejection of claim 66 has been overcome and that this claim is in condition for allowance.

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Claims 67-77

With regard to claim 67, among the differences, claim 67 recites “depositing an oxide layer over a planarized surface.” (emphasis added). The Office Action indicated that this limitation is disclosed by Dubin at column 1, lines 32-33. Applicant respectfully traverses this assertion. This citation in Dubin discloses that a dielectric layer 12 “is typically formed out of silicon dioxide.” However, Dubin does not disclose or suggest that this dielectric layer 12 is deposited on a planarized surface.

Moreover, in the “Response to Arguments” section, the Office Action indicated that

the limitation of “depositing an insulator over a planarized surface” is a well known process step that is demonstrated by the Brown et al. reference, it is well known in the art to deposit over planarized surfaces in order to maintain a better step coverage, a better surface for subsequent depositions and to provide a better surface upon which photolithography steps will be applied, like is well known in the art. Office Action (Response to Arguments) at ¶2.

Under MPEP 2144.03, Applicant respectfully traverses this assertion and respectfully requests that the examiner cite a reference in support of their position. While the Office Action indicated that the Brown reference, in general, demonstrates this operation, the Office Action does not provide a citation within the Brown reference disclosing this operation. Therefore, Applicant requests a citation within the Brown reference disclosing this operation, a citation of a different reference and/or an affidavit by the Examiner as required by MPEP 2144.03. If the absent of references/affidavit, Applicant respectfully submits that the Office Action has failed to state a prima facie case of obviousness with respect to claim 67.

Furthermore, with regard to claim 67, among the differences, claim 67 recites “depositing a seed layer of copper on the barrier layer of tantalum nitride.” The Office Action indicated that this limitation is disclosed by Dublin at column 4, lines 7-15. See Office Action at ¶2. Further, in the “Response to Arguments” section, the Office Action indicated that “Dubin et al. performs an anneal process to form an aluminum/copper/titanium nitride multilayer film, thus the copper-aluminum film becomes a part of the barrier layer, and the seed layer is therefore deposited on the barrier layer.” Office Action (Response to Arguments) at ¶3. In other words, the Office

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Action is implying that when a conductive layer, which is on top of a barrier layer, is annealed, the conductive layer is transformed to become a part of the barrier layer (i.e., the conductive layer is absorbed into the barrier layer). Applicant respectfully traverses this assertion. As defined, the word "anneal" is defined to mean to "to subject (glass or metal) to heat and slow cooling so as to toughen and reduce bitterness". Webster's II New College Dictionary (Houghton Mifflin Co., Boston) (1995) (p. 45). The word "anneal" is not defined to include a transformation of a material and/or absorption of one material into a different material. Therefore, Dubin discloses the deposition of a copper-aluminum film on a barrier layer and not the deposition of a seed layer on the barrier layer. Therefore, Applicant respectfully submits that the rejection of claim 67 has been overcome and that this claim is in condition for allowance. Because claims 68-77 depend from and further define claim 67, Applicant respectfully submits that the rejections of claims 68-77 have been overcome and that these claims are in condition for allowance.

New Claims

Applicant has added new claims 186-189. Applicant respectfully submits that no new matter has been added. Further, Applicant respectfully submits that such claims are patentable over the cited art for at least the reasons forth above. Accordingly, Applicant respectfully submits that claims 186-189 are in condition for allowance.

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Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 371-2103 to facilitate prosecution of this application.

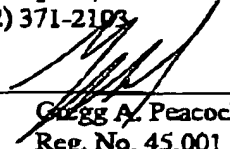
If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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Date 3-25-03

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